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ABSTRACT

The Strong-Campbell Interest Inventory (SCII) has been the most extensively used and researched interest inventory with college graduates. The present research focused on the use of the SCII in occupational counseling of prospective engineering students or of professionals. Specific objectives were to identify an interest profile of engineers using the revised SCII (Campbell & Hansen, 1981), to compare/contrast interest profiles of meaningful subgroups of engineers, classified according to sex, ethnic background, current career field, level of career satisfaction, and number of years since obtaining the bachelor's degree, and to examine the extent to which standard score means of independent samples on the SCII's two "Engineer" scales differ from the means of their respective norm samples. Data were collected from 488 engineers (174 females and 314 males). Results indicate that the "typical" engineer is a composite of rather heterogeneous groups of engineers and that SCII scales have a major utility for differentiating engineering specialities and for counseling potential engineers. Sex, career field, satisfaction, and experience differences were also found, indicating that although engineers tend to differ from non-engineers in interests, major subgroup differences within the engineering profession also occur. (JN)

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INTEREST PROFILES OF PROFESSIONAL ENGINEERS

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INTEREST PROFILES OF PROFESSIONAL ENGINEERS*

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Purdue University

Introduction

The Strong-Campbell Interest Inventory (SCII) has been the most extensively used and researched interest inventory with college (and prospective college) students and with college graduates. Moreover, the SCII possesses "the longest history of any psychological test in widespread use today" (Campbell & Hansen, 1981, p. v). Despite this long history, the Engineer scale(s) have been examined infrequently in contrasting engineering specialties. Nevertheless, research that has been conducted using the Engineer scale(s) (Barany & LeBold, 1971; Hansen, undated; Lewis, Wolins, & Hogan, 1965; Shell, 1982) has indicated meaningful group differences in mean scores which could be used to help students considering engineering or trying to select an appropriate specialty field within engineering. Furthermore, the Occupational Themes and Basic Interest Scales, much younger by comparison, apparently have been used infrequently (or at least seldom reported in publications) in examining engineers or engineering students and especially in comparing or contrasting specialties within engineering. Because of the 1981 revisions to the SCII, a crossvalidation of the Engineer scales and an examination of the Theme Scales and Basic Interest Scales with respect to professional engineers would be very beneficial in understanding the nature of those who pursue engineering.

There also seems to be a lack of information concerning the extent to which an independent sample might average lower on its relevant Occupational Scale than did its corresponding norm group. Such lower group means might result in part from three factors. First of all, discrepancies in average scores simply might result from the use of independent random samples of the same population (i.e., sampling error), in which case an independent sample might average either higher or lower than the norm group, usually by no more than two T-score units (approximately three standard errors of the mean). Secondly, discrepancies might result because the two samples do not represent the same population. In this case, the independent sample again might average higher or lower than the norm group with the difference reflecting the difference in populations and not bound by a two-unit probability limit. Thirdly, discrepancies might result from a regression-to-the-mean effect. In this case, an independent sample would average lower than the norm group and closer to the mean of "men-in-general" or "women-in-general." The extent to which the independent sample averages lower than the norm group would then tend to reflect the difference between the occupational population and the relevant general occupational universe. Thus, the

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more an occupational population differs from the general universe -- as does engineering -- the greater the extent of regression-to-the-mean effect with an independent sample.

Objectives

The present research focused upon the use of the SCII in occupational counseling of prospective engineering students or of professionals. Specifically, the objectives have been: (1) to identify an interest profile for professional engineers using the revised SCII (Campbell & Hansen, 1981); (2) to compare and contrast interest profiles of meaningful subgroups of engineers, classified according to sex, ethnic background, current career field, level of career satisfaction, and number of years since obtaining the bachelor's degree; and (3) to examine the extent to which the standard score means of independent samples (with respect to the norm samples) on the SCII's two Engineer scales differ from the means of their respective norm samples. Thus, this research seeks to "picture" the interests of professional engineers as a total general group and as separate meaningful subgroups. Furthermore, it seeks to estimate the extent to which the SCII norm groups do not accurately represent the average scores of their represented groups.

Procedures

Sample

During the spring and fall of 1981, SCII data were collected from professional engineers as part of the National Engineering Career Development Study. The sample consisted primarily of members of professional enginering societies but also included graduates from several specific universities and colleges with engineering programs. Complete data were available for 488 engineers of whom 174 were women and 314 were men. Data were also available for 20 minority engineers (Black and Hispanic Americans), which can serve as a preliminary examination group for comparing minorities and nonminorities. The engineers tended to be recent graduates, less than ten years in professional practice. In general, the women possessed less experience than the men.

Methodology

Standard score means were first calculated for the total sample of engineers for each SCII Occupational Theme, each Basic Interest Scale, the male and female Engineer scales, and the two Special Scales (Academic Comfort and Introversion-Extroversion). The total sample was then classified into subgroups according to sex, ethnic background, current main career field, level of satisfaction with their current position (on a 5-point scale), and number of years since obtaining the Bachelor's degree (categorized into five groups). Subgroups were contrasted using five-way regression ANOVA by means of the SPSS ANOVA program (NIE, Hull, Jenkins, Steinbrenner, & Bent, 1975) in order to eliminate interaction effects and to identify subgroup differences which are unique to a particular classification schema.

In keeping with procedures followed in selecting the SCII standardization and norm samples of Engineers, it was then decided to restrict the sample of professional engineers to only those who were satisfied with their current position in order to reexamine the SCII results. After thus restricting the full sample, subgroup comparisons were again performed using the subsample of 369 professional engineers. Within this sample, career fields were subsequently subdivided according to sex in order to facilitate examination of male-female differences within each field across the scales.

Results and Discussion

Professional Engineers In General

SCII means for the full sample (n=488) of professional engineers are presented in Table 1. These professional engineers exhibited above average realistic and investigative interests and below average social, artistic, and enterprising interests. In terms of basic interests, professional engineers were highly interested in mathematics especially, but also in mechanical activities and science. They were much less interested (and possibly disinterested) in social service, writing, music or dramatics, art, medical service, religious activities, merchandising, office practices, teaching, domestic arts, and sales. Professional engineers exhibited interests similar to those of professionals with doctoral degrees but indicated greater than average introversion, i.e., orientation toward individual rather than group or social activities.

Of special interest were the male and female Engineer scales. Professional engineers averaged at the female norm group mean on the women's scale but below the male norm group mean on the men's scale. Thus, the professional engineers in general exhibited interests similar to the interests of norm group female engineers but less similar to the interests of norm group male engineers.

In summary, professional engineers in general seem highly oriented to the pursuit of scientific knowledge but even more oriented to the application of this knowledge to practical problems. They are more oriented to personal than to group endeavors although not toward artistic activities. Their individualistic, nonsocial, and nonenterprising orientation may be related largely to their extensive scientific and physical-problem orientation. Thus, on a bipolar continuum they appear to be more oriented toward physical science problems than toward human (or behavioral science) problems.

Sex Differences. As noted in Table 1, numerous significant ($p<.0001$) and practical differences were observed between male and female professional engineers. Moreover, these differences tended to parallel similar differences among professional men and women in general, although the magnitude of interests were not comparable. While men were more highly oriented toward practical or realistic activities (such as mechanical activities, military activities, and adventure), as well as athletics, women were more highly oriented toward nature, domestic arts, and general artistic activities. Women also tended to have interests more similar to persons with doctorate degrees than did men.

Differences also existed, however, between the interest patterns of the men and women engineers and the patterns of professional men and women in general.

TABLE 1. Strong-Campbell Interest Inventory Standard Score Means of Professional Engineers Grouped According to Total, Sex, Ethnicity, Current Main Career Field, Satisfaction Level, and Years Since Bachelor's Degree with Grouping Factor Interactions Removed in ANOVA tests.

SCII SCALE	GENERAL NORMS M	GENERAL NORMS F	ENGR NORMS M	ENGR NORMS F	TOT	SEX M	SEX F	ETHNIC GROUP Min	ETHNIC GROUP Maj	CURRENT MAIN CAREER FIELD AgE	ChE	CE	EE	IE	ME	RE	OtE	SATISFACTION LEVEL VS	S	NS	YEARS SINCE BACHELOR'S A	B	C	D	E	TOTAL STANDARD DEV.
OCCUPATIONAL THEMES:																										
Realistic	54	45	60	56	57	58	54e	55	57	63	54	57	55	56	59	60	55c	57	57	56	56	58	57	57	55	10
Investigative	51	48	57	57	55	55	55	55	55	55	57	52	56	53	55	56	55d	55	55	53	55	55	54	55	55	8
Artistic	47	53	45	51	45	43	48e	47	45	42	47	43	47	45	45	48	45a	45	45	46	47	47	45	43	44	10
Social	49	51	44	43	43	43	43	45	43	44	44	44	43	43	41	41	42	43	43	43	45	43	41	44	43a	10
Enterprising	52	48	48	47	46	47	46	49	46	47	47	46	47	48	45	47	47	47	47	46	47	46	46	47	47	8
Conventional	50	50	51	50	50	50	50	51	50	52	50	50	51	54	48	48	50c	51	50	49	50	49	49	50	52	8
(Holland Code)	REI	ASC	RIC	IRC	RIC	RIC	IRC	RIC	RIC	RIC	IRC	RIC	IRC	RCI	RIC	RIC	IRC	RIC	RIC	RIC	RIC	RIC	RIC	RIC	RIC	
BASIC INTEREST SCALES:																										
R Agriculture	51	49	53	50	51	52	50c	49	52	59	49	54	49	48	52	58	48e	51	51	52	51	53	51	51	51	10
Nature	48	52	49	53	50	48	53e	46	50	55	49	50	48	49	50	57	46b	49	50	51	51	53	49	49	47	11
Adventure	54	46	52	51	52	53	49e	54	51	53	50	52	51	49	52	54	52	52	51	50	52	52	53	52	48e	9
Military Activities	53	47	53	50	51	53	48e	51	51	51	49	52	50	52	51	53	51	53	50	48a	50	48	50	53	54	10
Mechanical Activities	54	45	61	57	58	59	55e	58	58	62	56	56	58	57	61	59	57d	59	58	56	57	58	59	58	57	9
I Science	52	48	59	57	56	56	55	56	56	58	58	52	58	53	57	58	56c	57	56	54	56	56	56	56	56	8
Mathematics	52	48	60	60	60	60	59	59	60	60	60	58	61	61	62	59	60c	61	60	58c	59	59	60	60	61	5
Medical Science	50	50	51	52	50	49	50	49	50	49	52	48	51	49	49	54	50a	49	50	49	50	50	50	51	48	10
Medical Service	47	53	46	47	45	45	45	47	45	47	46	46	46	45	44	47	44	45	46	45	47	47	44	45	44a	7
A Music/Dramatics	46	54	44	52	45	43	50e	47	45	43	47	43	47	46	46	48	46	45	45	47	48	47	45	42	44	10
Art	45	55	44	52	45	42	49e	45	45	43	45	42	47	44	45	48	44a	44	45	46	47	47	44	42	43	10
Writing	47	52	44	50	44	42	46e	44	44	41	46	42	45	44	42	45	44	44	43	44	44	45	42	42	45b	10
S Teaching	48	52	48	45	46	45	46	46	46	45	47	46	47	44	43	44	45a	46	45	45	46	46	44	46	47	9
Social Service	47	52	40	42	41	40	42b	42	40	41	42	41	41	41	39	38	41	40	40	43a	42	41	38	42	41c	8
Athletics	53	47	50	45	49	52	45e	51	49	51	48	53	48	47	48	50	48a	49	49	48	51	49	50	49	48e	10
Domestic Arts	43	57	43	51	46	43	51e	44	46	45	45	46	47	47	45	45	45	45	47	47	49	48	44	45	42a	10
Religious Activities	48	51	46	45	45	45	45	46	45	48	46	46	45	45	45	44	44	46	45	45	47	45	43	46	47b	10
E Public Speaking	52	48	47	47	47	47	46	50	47	46	47	47	48	46	46	47	47	48	47	46	48	46	45	47	49	9
Law/Politics	52	47	49	48	48	48	48	50	48	48	49	48	47	48	47	47	49	49	48	48	49	47	47	49	49	9
Merchandising	50	50	46	48	45	45	47	47	45	44	45	45	46	50	44	46	44	45	45	46	46	46	44	45	46	9
Sales	53	47	48	46	46	47	45c	49	46	45	46	47	47	46	46	45	46	46	46	46	46	46	46	46	48	8
Business Management	52	48	50	49	49	49	48	51	49	49	49	48	48	54	48	49	49b	50	49	48	48	48	48	50	51	9
C Office Practices	47	53	45	46	45	44	45	43	45	45	44	45	46	46	43	44	45	45	45	45	45	44	43	45	46	7
OCCUPATIONAL SCALES:																										
F Engineer	40	22	54	50	50	52	47e	50	50	54	49	47	50	49	55	53	50e	52	51	48c	47	50	53	51	50d	10
M Engineer	28	19	50	41	44	46	40e	41	44	48	43	40	44	41	48	45	44e	45	44	41a	40	43	45	45	45	11
SPECIAL SCALES:																										
Academic Comfort	44	48	51	54	49	47	52e	48	49	47	54	45	51	46	47	51	50e	50	48	48	49	50	47	48	50	13
Introvert-Extrovert	50	50	56	54	56	57	56	53	56	58	56	56	55	56	58	55	57	55	56	57	54	57	58	58	55	11
SAMPLE SIZE	300	300	228	201	488	314	174	20	427	19	64	109	88	41	93	26	49	139	230	98	103	101	123	81	81	

TOT - Total Group
M - Male
F - Female
Min - Minority
Maj - Majority

AgE - Agricultural Engineering
ChE - Chemical Engineering
CE - Civil Engineering
EE - Electrical Engineering
IE - Industrial Engineering
ME - Mechanical Engineering
RE - Resource (Mining, Geological, Mineral, Petroleum) Engineering
OtE - Other Engineering

VS - Very Satisfied
S - Satisfied
NS - Not Satisfied

A - 1-2 Years
B - 3-4 Years
C - 5-9 Years
D - 10-18 Years
E - 19-70 Years

a - $p<.05$ b - $p<.01$ c - $p<.005$ d - $p<.001$ e - $p<.0001$

Women-in-general tended to exhibit more interest than men-in-general in medical service, office practices, and teaching, while men-in-general tend to exhibit more interest in science, mathematics, law and politics, public speaking, and business management. However, no such differences were found for women and men engineers. Thus, these results indicate that women engineers possess interests which are intermediate between male engineers and women-in-general, but more similar to the former.

Of particular importance, not only did men average higher than women on the male Engineer scale, but also on the female engineer scale. This finding may be best explained by a combination of two "facts." First, male engineers tend to exhibit a larger number of general (and strong) engineering characteristics than do female engineers, while female engineers tend to exhibit a larger number of traditionally nonengineering characteristics. Secondly, women engineers are more similar than men engineers to women-in-general, as well as to men-in-general, in terms of engineering characteristics.

Ethnic Differences. The underrepresented minority engineers (Black and Hispanic Americans) exhibited interests which were very similar to interests of majority engineers. Although undoubtedly due to the small number of minority engineers, no mean differences were significant at $p=.05$. However, few differences were large enough to have been sufficiently practical if the number of minority engineers had been large enough to adequately indicate great significance.

Career Field Differences. As shown in Table 1, numerous career field differences were found. With respect to general occupational themes and relative to the other fields, agricultural engineers exhibited the most realistic or practical interests and were one of the groups to exhibit the least artistic interests. In contrast, chemical engineers were one of the groups to display the most artistic interests, but they also exhibited the least realistic interests. Civil engineers were one of the groups to express the least investigative and artistic interests, while electrical engineers exhibited among the most artistic interests. Industrial exhibited the most conventional interests but among the least investigative interests. Mechanical and resource (mining, geological, mineral, and petroleum) engineers displayed among the least conventional interests, with resource engineers exhibiting among the most artistic interests. As also noted in Table 1, the three-letter Holland code differed from the engineer-in-general code of RIC (Realistic, Investigative, Conventional) for four of the eight fields: chemical, electrical and "other" engineers (IRC) and industrial engineers (RCI).

With respect to basic interests, relative to the other fields, engineers were among the most interested in mechanical activities, agriculture, science, and nature. Chemical engineers were among the most interested in science and teaching but among the least interested in agriculture. Civil engineers were the most interested in athletics but among the least interested in art, medical science, science, and mathematics. Electrical engineers were among the most interested in mathematics, science, art, and teaching, but were among the least interested in agriculture. Industrial engineers were among the most interested in mathematics and business management but among the least interested in athletics, agriculture, and science. Mechanical engineers were among the most interested in mechanical activities but were the least interested in teaching.

Resource engineers were among the most interested in agriculture, science, nature, medical science, and art. All other engineers were among the least interested in nature and agriculture. Finally, chemical engineers exhibited the most comfort in academic situations, and civil engineers, the least comfort.

Career field differences were also found for both the male and female Engineer scales (see Table 1). Exhibiting the most female engineering interests were mechanical, agricultural, and resource engineers, while civil engineers exhibited the least interest. Similarly, mechanical and agricultural engineers displayed the most male engineering interests, and civil and industrial engineers, the least.

Satisfaction Level Differences. found for levels of job satisfaction (see Table 1). Accordingly, those engineers who were uncertain about, or dissatisfied with, their current position exhibited the least interest in military activities and mathematics and had fewer female or male engineering interests.

Experience Level Differences. Several significant and practical differences were found for number of years since Bachelor's degree, as shown in Table 1. Those engineers with less than five years of experience (the first two groups) were the most interested in domestic arts and medical service. Those engineers with three or four years of experience were among the least interested in athletics. Those with five to nine years of experience were the least interested in social service and religious activities and the least interested in writing. Those with 10 to 18 years of experience were among the least interested in writing, while those with 19 or more (up to 70) years of experience were the least interested in domestic arts and adventure and among the least interested in athletics. These last results are understandable considering the average of the last group.

An interesting finding was the presence of a few quadratic (rather than linear) group differences for a few scales. Such effects were found for the Social Occupational Theme, for basic interests in writing, social service, and religious activities, and for the female Engineer scale. Thus, based on these differences, engineers with the least experience, or the most experience expressed greater interest in religious activities, writing, and social service but fewer interests which are typical of female engineers than did engineers with a moderate amount of experience. Three possible explanations for this phenomenon include (1) historical group differences inherent within the age samples, (2) the changing nature of an individual pursuing an engineering career, and (3) developmental changes occurring within individuals during a career in engineering. Such a phenomenon may merit future research.

In summary, therefore, the interest profile of a "typical" engineer is not adequate to characterize all engineers but simply results as an averaging effect. Rather than being "made from a common mold," engineers can be divided into meaningful groups according to sex, specific engineering career field, level of job satisfaction, number of years of experience, and probably numerous others (e.g., job functions performed), with each subgrouping possessing its own unique (but homogeneous) profile of characteristics.

Satisfied Professional Engineers in General

For the restricted sample of satisfied engineers (more comparable than the original sample to the norm sample), standard-score means are presented in Table 2. As this table shows, few and only slight variations in mean scores resulted, as compared to the means for the full sample in Table 1. This is true whether one considers the total sample means or subdivides the sample into the meaningful groupings. Thus, to report the separate group differences here would duplicate Table 1 results.

Because of the numerous sex differences found in the interests of engineers and because of the relatively large number of men and women in the sample, separate SCII mean scores are presented in Table 3 for men and women within the career fields, satisfaction levels, and years of experience groups. Although statistical tests of significance were not performed on each male-female comparison individually, numerous differences may be noted in the table, which tend to parallel the main effects sex differences (as already noted in Table 2). However, as noted in Table 3, only four significant interaction-with-sex differences were observed: interest in agriculture, adventure, social service, and athletics.

Mean Score Reduction in SCII Engineer Scales

The last major objective in the present research is the examination of the extent to which similar, but independent, engineer samples obtain mean scores on their like-sex SCII Engineer scale lower than their respective norm group. Thus, as noted in Table 2, although women engineers experienced inappreciable mean reduction on their female Engineer scale, men engineers experienced an appreciable reduction on their male Engineer scale from the norm group mean of 50 to the present mean of 46. This reduction would thus suggest that, for male engineers, the scale cutoff scores should be adjusted when used for individual counseling in order to compensate for this finding. For example, with the present sample, a score of 37 on the male Engineer scale (comparable to a score of 41 by the norm group) should represent somewhat similar interests with male engineers rather than the mid-range interests a score of 37 represents on the profile. Thus, with the present sample, a male Engineer score of 37 represents the 18th percentage of male engineer interests, although the norm group places it at the 10th percentile. It should be noted, however, that such mean score reduction is probably important only for individuals scoring just below the range of somewhat similar interests.

It might also be noted again that significant career field differences were found among women on the female Engineer scale and among men on the male Engineer scale. Thus, among women, mechanical engineers were highest (and civil engineers, lowest) on the female Engineer scale. Similarly among men, mechanical and industrial engineers were highest (and civil engineers, lowest) on the male Engineer scale.

In summary, the two Engineer scales do not equally represent the subfields of engineering, nor does the male Engineer scale represent adequately the interests of male engineers. The former lack of subfield or specialty representation may be explained, however, by the fact that each career field within the total current sample is not represented the same as within the norm group. The

TABLE 2. Strong-Campbell Interest Inventory Standard Score Means of Satisfied Professional Engineers Grouped According to Total, Sex, Ethnicity, Current Main Career Field, Satisfaction Level, and Years Since Bachelor's Degree with Grouping-Factor Interactions Removed in ANOVA tests.

SCII SCALE	GENERAL NORMS M	GENERAL NORMS F	ENGR NORMS M	ENGR NORMS F	TOT	SEX M	SEX F	ETHNIC GROUP Min	ETHNIC GROUP Maj	CURRENT MAIN CAREER FIELD AgE	ChE	CE	EE	IE	ME	RE	OtE	SATISFACTION LEVEL VS	S	YEARS SINCE BACHELOR'S A	B	C	D	E	TOTAL STANDARD DEV.
OCCUPATIONAL THEMES:																									
Realistic	54	45	60	56	57	59	54e	55	57	62	55	58	56	55	59	59	55	57	57	56	58	57	58	56	9
Investigative	51	48	57	57	55	55	56	55	55	55	57	52	57	53	56	56	56c	55	55	55	55	54	56	55	8
Artistic	47	53	45	51	45	42	48e	48	45	41	46	42	47	45	44	47	46a	45	45	46	47	44	43	44	10
Social	49	51	44	43	43	43	43	45	43	41	46	44	44	43	41	41	42	43	43	45	42	41	44	43	9
Enterprising	52	48	48	47	47	47	46	49	46	45	47	46	47	49	45	47	47	47	46	47	46	45	47	48	8
Conventional	50	50	51	50	51	51	50	51	51	51	51	50	51	55	49	49	50a	51	50	51	50	49	50	53	8
(Holland Code)	REI	ASC	RIC	IRC	RIC	RIC	IRC	RIC	RIC	RIC	IRC	RIC	IRC	CRI	RIC	RIC	IRC	RIC	RIC	RIC	RIC	RIC	RIC	RIC	
BASIC INTEREST SCALES:																									
R Agriculture	51	49	53	50	51	52	50c	50	51	60	49	55	50	48	51	58	47e	52	51	51	53	52	51	51	10
Nature	48	52	49	53	50	48	53e	45	50	57	50	50	49	49	49	57	47b	49	50	51	52	50	49	47	11
Adventure	54	46	52	51	52	53	49e	54	52	52	50	53	52	49	52	54	52	53	51	52	52	54	53	49e	9
Military Activities	53	47	53	50	51	53	48e	53	51	50	50	52	51	52	51	54	51	53	50a	51	50	50	53	54	10
Mechanical Activities	54	45	61	57	58	60	56e	58	58	62	58	57	59	56	61	58	57b	59	58	58	59	58	59	58	9
I Science	52	48	59	57	56	56	57	55	56	59	58	53	58	54	57	58	57e	57	56	56	56	56	57	56	8
Mathematics	52	48	60	60	60	60	60	59	60	62	60	58	62	62	60	59	60e	61	60	60	60	60	61	61	5
Medical Science	50	50	51	52	50	49	51	49	50	49	52	48	51	49	50	54	51	49	50	51	50	49	52	48	10
Medical Service	47	53	46	47	45	45	46	47	45	44	46	45	47	46	44	48	49	45	46	47	47	44	46	44a	7
A Music/Dramatics	46	54	44	52	45	43	50e	48	45	40	46	42	47	47	45	47	47a	45	45	47	47	45	42	44	10
Art	45	55	44	52	45	42	49e	46	45	41	46	41	47	44	45	48	46a	44	45	47	46	44	42	44	10
Writing	47	52	44	50	44	42	46e	45	44	39	46	42	46	45	42	44	46	44	43	44	45	42	42	46a	10
S Teaching	48	52	48	45	46	46	46	47	46	42	47	47	48	44	43	44	45a	46	46	46	45	44	46	47	9
Social Service	47	52	40	42	40	39	41	42	40	37	43	40	41	41	39	38	41	41	40	41	40	37	42	40a	8
Athletics	53	47	50	45	49	51	45e	51	49	50	47	52	49	47	43	49	46	49	49	50	48	50	52	48b	10
Domestic Arts	43	57	43	51	46	43	51e	45	46	42	45	46	48	48	45	46	46	45	47	49	49	45	45	42a	10
Religious Activities	48	51	46	45	46	46	46	46	46	49	47	46	46	45	45	43	45	46	45	47	45	43	46	48a	10
E Public Speaking	52	48	47	47	47	48	46	51	47	46	48	48	48	48	46	47	48	49	47	48	46	46	48	49	9
Law/Politics	52	47	49	48	49	49	48	51	49	48	50	49	47	49	48	41	51	49	48	50	47	47	50	49	9
Merchandising	50	50	46	48	45	45	46	47	46	42	46	45	46	52	44	46	45b	46	45	46	46	44	45	47	9
Sales	53	47	48	46	46	47	44c	50	46	44	46	46	48	47	46	45	46	47	46	46	46	45	46	48	8
Business Management	52	48	50	49	49	50	48	52	49	48	51	48	48	55	48	49	49a	50	49	49	49	48	50	51	9
C Office Practices	47	53	45	46	45	45	45	44	45	42	42	46	46	46	43	43	45	45	45	45	44	43	45	47	7
OCCUPATIONAL SCALES:																									
F Engineer	40	22	54	50	51	52	49e	50	51	57	50	48	50	49	55	52	50e	52	51	49	52	53	52	50a	9
M Engineer	28	19	50	41	44	46	41e	40	45a	41	44	42	45	40	49	44	44e	45	44	42	45	45	46	45	11
SPECIAL SCALES:																									
Academic Comfort	44	48	51	54	49	47	53e	49	49	47	54	45	52	47	48	50	52d	50	49	49	50	47	49	50	13
Introvert-Extrovert	50	50	56	54	56	56	56	51	56	60	55	56	54	55	58	54	56	55	57	53	57	57	57	55	11
SAMPLE SIZE	300	300	228	201	369	243	125	16	332	13	46	81	69	29	70	24	37	139	230	78	71	83	69	68	

TOT - Total Group
M - Male
F - Female
Min - Minority
Maj - Majority

AgE - Agricultural Engineering
ChE - Chemical Engineering
CE - Civil Engineering
EE - Electrical Engineering
IE - Industrial Engineering
ME - Mechanical Engineering
RE - Resource (Mining, Geological, Mineral, Petroleum) Engineering
OtE - Other Engineering

VS - Very Satisfied
S - Satisfied

A - 1-2 Years
B - 3-4 Years
C - 5-9 Years
D - 10-18 Years
E - 19-70 Years

a - $p<.05$ b - $p<.01$ c - $p<.005$ d - $p<.001$ e - $p<.0001$

TABLE 3. Strong-Campbell Interest Inventory Standard Score Means for Men and Women Satisfied Engineers Grouped By Current Main Career Field, Satisfaction Level, and Years Since Bachelor's Degree with Significant Grouping-Factor Interactions-by-Sex Indicated.

SCII SCALE	CURRENT MAIN CAREER FIELD														SATISFACTION				YEARS SINCE BACHELOR'S DEGREE									
	ChE		CE		EE		IE		ME		RE		OtE		VS		S		A		B		C		D		E	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
OCCUPATIONAL THEMES:	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Realistic	56	55	59	54	57	54	64	50	61	55	61	57	55	54	59	55	59	54	59	54	63	53	58	56	60	53	56	54
Investigative	57	58	52	51	55	58	54	53	55	57	57	53	56	57	54	58	55	55	55	55	56	55	53	56	55	59	55	52
Artistic	45	49	41	46	44	51	40	48	43	47	46	49	46	48	42	49	43	48	42	49	45	48	43	48	41	48	44	44
Social	45	47	44	42	43	46	45	41	42	40	42	40	42	43	43	44	43	42	44	45	43	42	41	40	45	41	43	45
Enterprising	47	48	46	44	48	47	50	49	45	44	49	43	48	45	47	46	47	46	48	47	46	46	45	45	48	44	48	46
Conventional	52	50	51	48	51	51	59	53	48	50	50	47	51	47	51	50	51	50	51	50	50	50	48	52	51	48	54	45
(Holland Code)	IRC	IRC	RIC	RIC	RIC	IRC	RCI	CIR	RIC	IRC	RIC	RIA	IRC	IRA	RIC	IRC	RIC	IRC	RIC	IRC	RIC	IRC	RIC	RIC	RIC	IRC	RIC	RIE
BASIC INTEREST SCALES:																												
R Agriculture	49	50	56	53	50	49	50	46	53	46	57	59	47	46	52	50	52	49	51	51	55	50	52	50	54	43	50	53b
Nature	47	55	49	54	47	53	49	49	48	51	54	61	45	48	48	54	49	53	48	53	51	54	47	55	49	49	47	48
Adventure	50	50	56	45	53	53	50	49	54	47	57	51	52	48b	54	50	53	49	54	50	57	47	54	51	54	48	49	48
Military Activities	52	46	53	48	51	50	60	47	53	48	56	50	52	48	55	49	52	48	52	49	53	46	51	49	55	49	54	47
Mechanical Activities	58	57	57	54	61	56	64	51	63	59	60	56	57	57	59	57	60	55	61	56	63	54	58	58	60	56	58	55
I Science	58	58	53	53	57	59	58	51	57	57	57	58	57	60	56	58	56	56	56	56	58	55	55	57	56	61	56	52
Mathematics	60	51	58	59	62	62	63	61	51	60	61	55	61	60	61	61	60	60	61	59	60	60	60	62	60	62	61	60
Medical Science	51	55	48	47	49	55	49	49	49	51	55	53	52	49	49	51	50	51	50	51	49	51	48	52	51	54	49	44
Medical Service	46	46	45	45	46	48	48	45	44	44	47	49	45	44	45	45	46	46	47	47	47	47	44	44	46	43	44	45
A Music/Dramatics	45	50	40	46	43	52	41	51	43	48	44	52	46	59	42	51	43	49	42	51	44	50	43	48	40	48	44	47
Art	43	51	40	47	44	50	39	46	42	49	46	51	45	49	42	50	42	49	42	50	44	49	41	49	40	48	43	44
Writing	45	47	41	44	43	50	42	46	41	44	44	45	45	48	43	48	42	45	40	46	43	47	40	46	40	47	46	43
S Teaching	48	47	46	49	47	50	45	44	45	40	43	44	45	45	45	47	46	45	46	46	45	46	45	43	46	45	47	50
Social Service	42	44	40	39	39	43	42	40	38	40	36	41	40	44	40	42	39	41	38	44	38	41	37	38	42	39	40	42a
Athletics	48	45	54	46	50	48	52	45	51	42	54	42	48	42a	51	45	52	45	52	48	52	43	53	43	52	41	49	43
Domestic Arts	42	52	44	54	47	50	43	51	43	48	40	54	44	52	43	50	44	51	45	52	46	52	43	50	44	48	41	47
Religious Activities	47	47	47	42	45	47	45	44	45	45	44	42	43	48	47	44	45	46	45	47	46	45	43	42	46	45	48	44
E Public Speaking	48	47	48	45	49	46	48	47	46	47	48	45	50	44	50	45	47	46	48	48	47	45	46	45	49	45	49	49
Law/Politics	49	51	50	46	48	47	49	49	47	50	49	44	51	50	50	48	48	48	49	50	48	46	47	47	51	49	49	50
Merchandising	45	46	45	46	45	47	50	53	44	44	48	43	46	42	45	46	45	46	44	47	45	47	43	45	46	44	47	47
Sales	46	46	47	44	50	46	49	46	47	44	48	41	47	44	47	45	47	44	48	45	47	45	45	45	48	42	48	45
Business Management	51	51	49	47	48	48	56	54	48	48	53	44	51	43	50	49	49	48	48	49	48	50	48	48	51	45	52	49
C Office Practices	45	44	46	45	46	46	49	45	43	45	43	44	45	45	45	45	45	45	44	45	43	46	43	44	45	43	47	43
OCCUPATIONAL SCALES:																												
F Engineer	51	50	49	45	53	47	53	47	57	53	55	48	51	48	52	50	52	48	53	46	56	47	53	53	52	52	50	50
M Engineer	45	42	43	40	47	41	50	34	50	46	45	41	45	41	46	42	46	41	47	39	49	40	45	45	46	45	46	41
SPECIAL SCALES:																												
Academic Comfort	52	57	43	50	49	57	46	47	46	51	48	52	51	54	47	56	47	52	45	52	47	53	45	52	47	57	50	50
Introvert-Extrovert	55	52	55	59	54	55	59	52	58	57	51	59	54	58	55	55	57	56	54	53	57	56	57	58	56	60	55	55
SAMPLE SIZE	29	15	57	18	38	26	12	18	43	25	12	9	25	9	93	38	131	85	29	44	36	33	54	22	48	17	57	7

ChE - Chemical Engineering
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VS - Very Satisfied
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a - $p<.05$ b - $p<.01$ c - $p<.005$ d - $p<.001$ e - $p<.0001$

norm group was more restricted in representing a variety of specialties, concentrating more heavily on electrical and mechanical engineers.

Conclusions

From the results discussed it seems evident that the "typical" engineer is actually a composite of rather heterogeneous groups of engineers. SCII scales have major utility for differentiating engineering specialties and for counseling potential engineers (and probably even students). However, sex, career field, satisfaction, and experience differences were also observed. Thus, although engineers tend to differ from nonengineers in interests, major subgroup differences within the engineering profession also occur. Moreover, for men, interpretation of the male Engineer scale should incorporate a slight correction for the reduction of the mean score found.

References

Barany, J. W., & LeBold, W. K. The Strong interest test and other factors influencing selection of industrial engineering as a career choice. Paper presented at the Twenty-Second Institute Conference and Convention of the American Institute of Industrial Engineers, Boston, May 1971.

Campbell, D. P., & Hansen, J. C. Manual for the Strong-Campbell Interest Inventory (3rd Ed.). Stanford: Stanford University Press, 1981.

Hansen, J. C. Interests of engineers: Civil and otherwise. Invited address at a civil engineering meeting on education, undated.

Lewis, E. C., Wolins, L., & Hogan, J. Interest and ability correlates of graduation and attrition in a college of engineering. American Educational Research Journal, 1965, 2 (2), 63-74.

Nie, H. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., & Bent, D. H. (Eds.), Statistical package for the social sciences (2nd ed.). New York: McGraw-Hill, 1975.

Shell, K. D. Utility of cognitive and noncognitive factors in predicting academic status and curricular specialization of beginning engineering students (Doctoral dissertation, Purdue University, August 1982). Dissertation Abstracts International, 1983, 43 (8), 2697-B. (University Microfilms International Order No. DA8300959).